3. (New) The ceramic heater according to claim 2, wherein said leakage quantity is within a range of 1×10^{-10} to 8×10^{-8} Pa · m^3 / sec(He).

4. (New) The ceramic heater according to claim 2, wherein material of said ceramic substrate is selected from the group consisting of aluminum nitride, silicon nitride, boron nitride, and titanium nitride.

5. (New) The ceramic heater according to claim 2, wherein said ceramic substrate has a thickness of 50 mm or less.

6. (New) The ceramic heater according to claim 2, wherein said ceramic substrate contains an oxide.

A1 Cont

7. (New) The ceramic heater according to claim 2, wherein said ceramic substrate contains an oxide selected from the group consisting of alkali metal oxide, alkaline earth metal oxide and rare earth oxide.

8. (New) The ceramic heater according to claim 2, wherein said ceramic substrate is disk-shaped.

9. (New) The ceramic heater according to claim 2, wherein said ceramic substrate is used at a temperature of 100°C or higher.

10. (New) The ceramic heater according to claim 2, wherein said ceramic heater is used in the semiconductor industry.

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 2-10 are presently pending in this application, Claim 1 having been canceled and Claims 2-10 having been added by the present amendment.

In the outstanding Office Action, Claim 1 was rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Atari et al. (U.S.Patent 5,413,360).

New Claims 2-10 are fully supported by the specification, drawings and claims as originally filed.[1] Applicants therefore submit that no new matter has been introduced.

Briefly recapitulating, Claim 2 is directed to a ceramic heater having a heating element formed on a surface of a nitride ceramic substrate or inside a nitride ceramic substrate. The ceramic substrate includes 0.05 to 10% by weight of oxygen. The ceramic substrate has a leakage quantity of 1×10^{-10} to 1×10^{-7} Pa $\cdot$ m^3 / sec (He) by measurement with a helium leakage detector.

According to the present invention recited in Claim 2, a nitride ceramic comprises 0.05 to 10% by weight of oxygen to ensure high thermal conductivity. At the same time, by adjusting the degree of the sintering so that the leakage quantity is within the range of 1×10^{-10} to 1×10^{-7} Pa $\cdot$ m^3 / sec (He), a drop in thermal conductivity at a high temperature due to the excess of degree of the sintering is prevented, and the temperature rising/falling property of the ceramic heater is improved.

This is understood from the comparison of Examples and Comparative examples. In Comparative examples 2 and 3 wherein oxygen content is less than 0.05% by weight, thermal conductivity is 140 W/mK and cooling time is 45 to 50 seconds. On the contrary, in Examples 1 to 11 wherein oxygen content is above 0.05% by weight, thermal conductivity is as high as 160 to 180 W/mK. In Examples 1 to 12, cooling time, which has a correlation with thermal conductivity, is shown to be as short as 25 to 35 seconds.

---

[1]For example, the present specification, page 1, lines 5-6; page 7, lines 15-17 and 25-26; page 9, lines 5-6, 20-21 and 23-28; page 10, lines 4-5 and 5-7; page 11, lines 10-18; and page 29, line 20.

By adjusting the degree of the sintering so that the leakage quantity is within the range of 1×10^{-10} to 1×10^{-7} Pa · m^3/ sec (He), diffusion of oxygen into the ceramic crystals due to the excess of degree of the sintering is prevented, and so a drop in thermal conductivity at a high temperature is prevented.

This is understood from the comparison of Example 13 and Examples 1 to 12. In Example 13, wherein the leakage quantity is 8×10^{-13} Pa · m^3/ sec (He), the thermal conductivity at a high temperature (450°C) is lower than that of Examples 1 to 11, wherein the leakage quantity is 8×10^{-8} to 1×10^{-10} Pa · m^3/ sec (He). In addition, cooling time is 25 to 35 seconds in Examples 1 to 12, while it is as long as 45 seconds in Example 13.

The reason for such phenomenon is supposed, as described in the specification, that if sintering proceeds too far, oxygen is diffused into the ceramic crystals and thus deteriorates the crystallinity and the thermal conductivity at a high temperature drops.

As described above, according to the present invention recited in Claim 2, the temperature rising/falling property of the ceramic heater is improved by keeping the oxygen content at a certain level so that the thermal conductivity is ensured, and by suppressing the densification so that the leakage quantity is within a specific range, and thus a drop of thermal conductivity at a high temperature is prevented.

The Office Action asserts that Atari et al. disclose a ceramic substrate having a conductor on a surface or inside thereof.[2] However, Atari et al. fail to disclose that the ceramic substrate has a leakage quantity of 1×10^{-10} to 1×10^{-7} Pa · m^3/ sec (He) by measurement with a helium leakage detector.

[2]The outstanding Office Action, page 2, lines 12-13.

The Office Action further asserts that Atari et al. inherently disclose a ceramic substrate that has a leakage quantity of 10^{-7} Pa · m^3/ sec (He) or less since Atari et al. disclose the layers desired by the applicant.[3] However, MPEP 2112 states:

> The fact that a certain result or characteristics may occur or be present in the prior art is not sufficient to establish the inherency of the result or characteristic.[4]

In the present case, the ceramic substrate disclosed in the Atari et al. reference does not necessarily have a leakage quantity of 1×10^{-10} to 1×10^{-7} Pa · m^3/ sec (He) since the leakage quantity indicates compactness or denseness of the ceramic substrate.

In addition, although generally smaller leakage quantity is desirable, compactness or denseness is suppressed in the present invention so that leakage quantity is 1×10^{-10} Pa · m^3/ sec (He) or more. Therefore, a drop of thermal conductivity at a high temperature is prevented. Atari et al. fail to teach such concept.

Heat conductivity of the ceramics disclosed in Atari et al. is 42 W/mK at 25°C (Table 4) at the highest. It is completely different from the values shown in Examples 1 to 12 in the present invention. Therefore, it is unlikely that the leakage quantity of the ceramics disclosed in Atari et al. is at the same level as the leakage quantity shown in the present invention. Comparison of properties does not identify Atari et al with the present invention at all, and does not suggest the present invention either.

Furthermore, Atari et al. do not disclose a sintering method of the ceramic substrate. Thus, the leakage quantity thereof is not reproducible.

---

[3]The outstanding Office Action, page 2, lines 13-15.

[4]In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (holding that "[t]o establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by person of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'"

Therefore, Atari et al. are not believed to in any way to anticipate or obviate the specific features recited in Claim 2. Thus, Claim 2 is believed to be allowable.

Substantially the same arguments as set forth above with regard to Claim 2 also apply to dependent Claims 3-10, which depend directly from Claim 2, respectively. Accordingly, each of the dependent claims is also believed to be allowable.

Consequently, in view of the amendments and in view of the indication of allowable subject matter, Applicant respectfully submits that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Masayasu Mori

Gregory J. Maier
Registration No. 25,599
Masayasu Mori
Registration No. 47,301
Attorneys of Record

22850

Tel: (703) 413-300
Fax: (703) 413-2220
GJM/MM:jm
I:\USER\MSMOR\IBIDEN\215899_Ame.wpd

Marked-Up Copy
Serial No: **09/926,499**
Amendment Filed on:
February 26, 2003

IN THE CLAIMS

Please cancel Claim 1 without prejudice and add new Claims 2-10:

--1. (Canceled)

2.- 10 (New)--